ACCESSION #: 9905190043

NON-PUBLIC?: N

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Oconee Nuclear Station, Unit Two PAGE: 1 OF 8

DOCKET NUMBER: 05000270

TITLE: Low Condenser Vacuum Results In A Reactor Trip To An

Inadequate Work Clearance Process

EVENT DATE: 06/03/98 LER #: 98-03-01 REPORT DATE: 05/11/1999

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 83

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: J. E. Burchfield, Regulatory TELEPHONE: (864) 885-3292

Compliance Engineer

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE TO NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On June 3, 1998, Oconee Unit 2 was returning to full power following a refueling outage. Units 1 and 3 were at 100% full power. At 1609 hours, Unit 2 automatically tripped from approximately 83% full power while holding for repair of a heater drain pump. The Reactor trip occurred on an anticipatory trip signal when Main Condenser vacuum decreased below the Main Turbine trip set point. Repair work on an Auxiliary Steam

(AS) System de-superheater created an air in-leakage pathway to the Condenser. The de-superheater was being repaired as part of a planned AS header outage for all three units. The work package for the repair of the de- superheater had been cleared for work and released to the field without proper isolation. After the trip, the vacuum leak was identified, isolated, and vacuum was restored to normal values. The plant's post trip response was normal. The root cause of this event is inadequate work clearance process. A contributing cause is an improper action. Corrective actions include revising the method for preparing, planning, reviewing, and approving block tagouts (including non-outage block tagouts).

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EVALUATION:

Background

A purpose of the Vacuum [EIIS:SH] system is to remove air and non condensable gases from the condenser [EIIS:SG] during operation. There are three main vacuum pumps which are shared between the three Oconee units. The pumps are used to establish the initial vacuum on the condenser and other components during startup. The three main vacuum pumps are secured and isolated once vacuum is being maintained by the Condensate Steam Air Ejectors (CSAE). The main vacuum pumps are available for emergency use in the event of decreasing condenser vacuum.

The Auxiliary Steam (AS) [EIIS:SA] system supplies the steam required for a unit startup when the Main Steam System is not available. It also supplies low pressure steam to various components on all three Oconee units. AS is delivered via a parallel header that allows any unit to isolate its AS header while continuing to maintain a pressurized header of steam to the other units. The entire AS header may be isolated with the units on line. Essential components are maintained operable by

transferring the steam supply to Main Steam [EIIS:SB] while the AS header is isolated. The AS system contains de-superheaters for the purpose of reducing steam temperature to prevent damage to various components including the 'E' Condensate/Feedwater Heaters and Plant Heating components.

A "block tagout" is defined by Nuclear Site Directives as the isolation and tagging of a defined portion of the plant to allow multiple work groups to perform work within the boundary. There is a Procedure (OP/1,2,3/B/1502/008 Block Tagout Procedure) which is written for use during outages. The process for non-outage block tagouts is not clearly defined.

Description of Event

On April 22, 1998, an Auxiliary Steam (AS) header outage meeting was held to discuss the scope of work for the week of June 1, 1998. The AS header

outage required that the AS header be isolated and depressurized. June was chosen because all three units were scheduled to be operating and the outside weather was warm enough that Plant Heating could also be taken out of service.

On May 12, 1998, Operations Coordinator-A (OC-A) (one of two assigned to Unit 3) was assigned to coordinate the AS outage that was scheduled to last approximately three days.

At a work scheduling meeting on May 20, 1998, Operations, Maintenance, and

Work Control agreed to the work scope for the AS header outage.

During the Unit 2 startup from a refueling outage, a flange leak was identified on 2AS-DS-0003, 'E' Heater De-superheater. On May 21, 1998, a work order was issued to repair the leak and this item was scheduled for the AS header outage.

On May 28, 1998, OC-A started marking components to be worked during the AS header outage by highlighting them on various Oconee Flow Diagrams (OFDs). The isolation boundaries were defined by Enclosure 3.11 "Isolating Auxiliary Steam To All Units When All Units Are Operating" of procedure OP/1/A/1106/022 (Auxiliary Steam System). Two additional procedures using the removal and restoration procedure process were developed for the Plant Heating System and Auxiliary Boiler. OC-A did not completely identify all the isolation boundaries by highlighting them on the OFDs. This is a process that is performed during outage Block Tagouts. Also, OC-A failed to recognize that the de-superheater was outside the AS header isolation boundaries.

On May 29, 1998, an Operations Guide was prepared and approved that included contingency actions if a Reactor trip occurred during the AS outage.

On May 30, 1998 through June 1, 1998, Operations performed Enclosure 3.11 of the AS System procedure and the two additional removal and restoration procedures to isolate the required portions of the Plant Heating System and Auxiliary Boiler.

On June 2, 1998, at 0600 hours, OC-A signed the "Clearance to Begin Work" on the work orders for all the mechanical work on the AS header. This was permission from Operations for Maintenance to begin work.

On June 3, 1998, the Maintenance crew assigned to repair the de-superheater flange leak received a pre-job briefing from their supervisor. One of the items discussed was that there was a purge in place on the AS header and to expect a slight vacuum when they lifted the flange.

At approximately 1545 hours, the flange was lifted to determine the gasket condition. The crew noticed a slight vacuum when the flange was lifted but thought it was due to the AS header purge. The crew determined the flange gasket was deteriorated but a lifting rig would be needed to remove the flange enough to replace the gasket. The crew then returned to their office area to make arrangements for obtaining lifting equipment.

At 1554 hours, the Unit 2 Control Room began receiving Operator Aid Computer (OAC) alarms associated with Main Condenser Vacuum and Main Feedwater [EIIS:SJ] Pump Turbine exhaust back pressure. Operators realized Main Condenser vacuum was decreasing. Unit 2 Control Room (CR) Senior Reactor Operator (SRO) contacted the Work Control Center (WCC) SRO to find out if any maintenance was in progress that could cause these alarms. The WCC SRO told the CR SRO he was not aware of any maintenance except the AS header work. The Unit 2 CR SRO initiated activities to place the Main Vacuum pumps in service.

At approximately 1609 hours, the main turbine automatically tripped on low Main Condenser Vacuum. The Reactor tripped from approximately 83% full power on an anticipatory trip signal. Operators confirmed that the Reactor and Turbine [EIIS:TA] had tripped and monitored the unit for proper operation. The Operators entered the Emergency Operating Procedure, and as normally required after a Reactor trip, a second High Pressure Injection [EIIS:BG] pump (2B) was manually started to maintain Pressurizer level. The Reactor Coolant System (RCS) [EIIS:AB] normal makeup source was out of service so an alternate makeup supply was utilized.

All primary and secondary parameters responded as expected. Pressurizer level decreased from a pre-trip level of 224 inches to a minimum of 76 inches before stabilizing at 116 inches. RCS pressure was at 2150 psig prior to the trip. It decreased to 1834 psig during the transient and stabilized at 2151 psig. RCS temperatures following the trip decreased to a minimum of 549 F before stabilizing at 551 F.

Steam Generator (SG) 2A and 2B levels were at 135 inches and 131 inches respectively prior to the trip. Both SGs reached a normal minimum level of 25 inches and was maintained following the trip. SG pressures were initially 892 psig for the 2A SG and 896 psig for the 2B SG. The post trip peak pressure was 1083 psig for the 2A SG and 1087 psig for the 2B SG. The 2A and 23 SGs subsequently stabilized at 973 psig and 971 psig respectively.

At approximately 1623 hours, the Unit 1 Operations Coordinator located the source of the vacuum leak, which was a Condensate/Feedwater heater de-superheater. This was reported to the Unit 2 Control Room and, at 1637 hours, the vacuum leak was isolated.

An Operations staff SRO identified valve 2AS-221 was open. 2AS-221 is a drain valve located between the de-superheater and the 'E' Condensate/Feedwater Heaters that created an additional vacuum leak. This valve should have been closed but was opened due to a procedure error in the AS isolation procedure.

The OAC data indicated that condenser vacuum and generated electrical output began to decrease around the time the crew started work and continued to decrease.

An identified issue of interest was a voltage drop in the 230 KV switchyard. The 230 KV switchyard voltage drop was caused by high grid loads at the time of the trip. Various DC motor starts were related to the post-trip voltage drop in the plant auxiliary power system. This is an expected system response considering the load conditions when the unit tripped. The voltage remained within acceptable limits and returned to normal.

On June 4, 1998, at 1500 hours, all the post trip items had been satisfied and the approval for re-start was granted. On June 5, 1998, at 0742 hours, Unit 2 reactor was returned to critical. on June 6, 1998, at 0624 hours,

the Main Turbine/Generator was placed in service.

Conclusion

This event was initiated by the loss of vacuum to the Main Condenser due to the removal of a flange on a de-superheater that was not adequately isolated. The circumstances leading up to the flange removal caused the event. While this work was referred to as an "Auxiliary Steam Block Tagout" and a Block Tagout Administrator was used to control the red tags, there was a misunderstanding about the process for a non-outage Block Tagout. Operations Coordinators had received verbal instructions, in team meetings, for tagouts which included having an independent review performed. However, OC-A did not utilize an independent review. Therefore, the root cause of this event is inadequate work clearance process for non-outage Block Tagouts.

An action which did not occur that could have prevented this event was that OC-A failed to recognize the flange work was outside the Auxiliary Steam isolation boundary. He assumed the de-superheater was in the Plant Heating System and had been isolated by the Plant Heating Removal and Restoration procedure.

Therefore, a contributing cause is an improper action.

A review of LERs and operating experience within the previous two years was conducted. There have been no LERs attributed to inadequate work process or improper action. Therefore, this event is considered to be non-recurring.

The event did not result in personnel injuries, radiation overexposures, or releases of radioactive materials. There were no equipment failures which contributed to the initiation of this event.

CORRECTIVE ACTION:

Immediate:

1. Operators took appropriate actions to stabilize the unit at hot shutdown.

2. The source of the vacuum leak was identified and isolated.

Subsequent:

1. The 'E' Heater De-superheater flange leak was repaired.

2. The Auxiliary Steam (AS) header was placed back in service.

3. Operations Coordinator-A was counseled concerning the improper action.

4. Procedures for isolating AS were placed on administrative hold until related corrective actions are completed from this event.

5. The Operations procedure for the AS System was revised to delete valves 1, 2, 3AS-221 from the enclosure that opened 2AS-221 during this event.

6. An improved process for work clearance and tagout was defined and implemented. Operations Management Procedure (OMP) 2-18 (Tagout Removal and Restoration Procedure), revision 0, approved on February 22, 1999, contains the Operations Management expectations for work clearance and tagouts including innage block tagouts. The review

requirements for Operations Matrix, Operations Staff, and Block Tagout Administrator personnel were included in this process.

7. The Operations Work Process Manager's (OWPM) group including Technical Support Supervisors, Tagging Team, Schedule Reviewers, and Unit Coordinators were trained in the requirements of OMP 2-18 (Tagout Removal and Restoration Procedure) on March 31, 1999. Control of block tagouts during innage periods was addressed.

Planned:

NONE

Subsequent corrective actions 6 and 7 are considered NRC Commitment Items. These are the only NRC Commitment Items included in this report.

SAFETY ANALYSIS:

A low Main Condenser Vacuum condition tripped the Main Turbine which resulted in a Reactor Trip. The Reactor Protective System [EIIS:JC] operated as designed and the plant post trip response was normal. No Engineered Safeguards System [EIIS:JE] or Emergency Feedwater [EIIS:BA] actuations were either required or received.

The health and safety of the public was not compromised by this event.

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